

On Page 1, please replace the paragraph referred to as "RELATED CASES" with the following paragraph, which is the clean version of the paragraph:

92 The present application is related to co-pending U.S. Patent Application No. 09/210,428 and U.S. Patent Application No. 09/210,086, all filed on December 10, 1998 and incorporated herein by reference.

In the claims:

Please cancel claims 7, 11, 18, 22 and 26-112 without prejudice.

Please amend claims 1-6, 12-13, 15-17, 19-20, 22-23 and 25 and add claims 113 – 152 as follows:

1. (Amended) An apparatus for characterizing one or more material properties for each of 5 or more samples, comprising:

m a substrate having 5 or more sensors disposed thereon to form a sensor array, wherein each sensor is associated with one of said 5 or more samples and characterizes at least one thermal property of said one of said 5 or more samples;

o an interconnection device electrically coupled with the sensor array; and

an electronic platform that sends signals to and receives signals from said sensor array via said interconnection device, wherein the signals received by said electronic platform correspond to said at least one thermal property and wherein said sensor array includes a plurality of thermometers disposed on a top surface of said substrate, and wherein said substrate includes a large area heater disposed on a bottom surface of said substrate.

2. (Amended) An apparatus for characterizing one or more material properties for each of 5 or more samples, comprising:

a substrate having 5 or more sensors disposed thereon to form a sensor array, wherein each sensor is associated with one of said 5 or more

samples and characterizes at least one thermal property of said one of said 5 or more samples;

a circuit board coupled to said sensor array;

a signal routing means coupled to said sensor array via said circuit board; and

an electronic platform that sends signals to and receives signals from said sensor array via said signal routing means, wherein said signal routing means selectively couples a sensor or a group of sensors in said sensor array to said electronic platform, and wherein the signals received by said electronic platform correspond to said at least one thermal property and wherein said sensor array includes a plurality of thermometers disposed on a top surface of said substrate, and wherein said substrate includes a large area heater disposed on a bottom surface of said substrate.

3. (Amended) An apparatus for characterizing one or more material properties for each of 5 or more samples, comprising:

a substrate having 5 or more sensors disposed thereon to form a sensor array, wherein each sensor is associated with one of said 5 or more samples and characterizes at least one thermal property of said one of said 5 or more samples;

a circuit board coupled to said sensor array via a connector, said circuit board having a signal routing means disposed thereon;

an electronic platform that sends signals to and receives signals from said sensor array via said signal routing means, wherein said signal routing means on said circuit board selectively couples a sensor or a group of sensors in said sensor array to said electronic platform, and wherein the signals received by said electronic platform correspond to at least one thermal property and wherein said sensor array includes a plurality of thermometers disposed on a top surface of said substrate, and wherein said substrate includes a large area heater disposed on a bottom surface of said substrate.

4. (Amended) An apparatus for characterizing one or more material properties for each of 5 or more samples, comprising:

a substrate having 5 or more sensors disposed thereon to form a sensor array, wherein each sensor is associated with one of said 5 or more samples and characterizes at least one thermal property of said one of said 5 or more samples;

a circuit board including:

a signal routing means; and

electronic test circuitry for sending signals to and receiving signals from said sensor array via said signal routing means, wherein the signals received by said electronic test circuitry correspond to said at least one thermal property of said 5 or more samples, and wherein said signal routing means on said circuit board selectively couples a sensor or a group of sensors in said sensor array to said electronic test circuitry; and

a computer coupled to said circuit board for controlling said signal routing means and said electronic test circuitry, receiving signals generated by said electronic test circuitry, and generating data corresponding to said at least one thermal property and wherein said sensor array includes a plurality of thermometers disposed on a top surface of said substrate, and wherein said substrate includes a large area heater disposed on a bottom surface of said substrate.

5. (Amended) An apparatus for characterizing material properties in a materials library, comprising:

a circuit board including:

a plurality of sensors disposed on said circuit board to form a sensor array, wherein each sensor in said sensor array measures at least one property of a material in the materials library;

a signal routing means; and

electronic test circuitry for sending signals to and receiving signals from said sensor array via said signal routing means, wherein the signals received by said electronic test circuitry correspond to said at least one property of a material in the materials library; and

a computer for controlling said plurality of sensors and said electronic test circuitry, receiving signals generated by said electronic test circuitry, and generating data corresponding to said at least one property of a material in

the materials library and wherein said sensor array includes a plurality of thermometers disposed on a top surface of a substrate of said circuit board, and wherein said substrate includes a large area heater disposed on a bottom surface of said substrate.

6. (Amended) An apparatus for characterizing material properties in a materials library, comprising:

a circuit board including:

a plurality of sensors disposed on a substrate mounted on said circuit board to form a sensor array, wherein each sensor in said sensor array measures at least one property of a material in the materials library; and

a signal routing means to route signals to and from said plurality of sensors; and

electronic test circuitry for sending signals to and receiving signals from said sensor array, wherein the signals received by said electronic test circuitry correspond to said at least one property of a material in the materials library; and

a computer for controlling said plurality of sensors and said electronic test circuitry, receiving signals generated by said electronic test circuitry, and generating data corresponding to said at least one property of a material in the materials library and wherein said sensor array includes a plurality of thermometers disposed on a top surface of said substrate, and wherein said substrate includes a large area heater disposed on a bottom surface of said substrate.

8. (Amended) The apparatus of claims 1-6, wherein the thermal property characterized by said sensor array is at least one selected from the group consisting of heat capacity, thermal conductivity, and thermal stability.

9. (Amended) The apparatus of claims 1-6, wherein at least one sensor in said sensor array comprises:

a microthin film membrane supported by said substrate such that said sensor array is an array of microthin film windows; and

a heater/thermometer pattern disposed on said microthin film membrane.

10. (Amended) The apparatus of claim 9, wherein said microthin film membrane forming said at least one sensor is a silicon nitride membrane, and wherein said substrate supporting said silicon nitride membranes in said sensor array is a silicon wafer.

12. (Amended) The apparatus of claims 1-6, wherein said microthin film membrane forming said at least one sensor is a silicon nitride membrane, and wherein said substrate supporting said silicon nitride membranes in said sensor array is a silicon wafer.

13. (Amended) The apparatus of claims 1-6, wherein said substrate is made of a polymer sheet, and wherein said sensor array includes a plurality of heaters/thermometers disposed on said polymer sheet.

15. (Amended) The apparatus of claim 13, wherein said plurality of heaters/thermometers is printed on said polymer sheet via lithography.

16. (Amended) The apparatus of claim 1-6, wherein said substrate is made of a poor thermal conducting material that is at least 100 microns thick, and wherein said sensor array includes a plurality of heaters/thermometers disposed on said poor thermal conducting material.

17. (Amended) The apparatus of claim 16, wherein said plurality of heaters/thermometers is printed on a glass plate via lithography.

19. (Amended) The apparatus of claim 1-6, wherein said substrate is made of a polymer sheet.

20. (Amended) The apparatus of claim 1-6, wherein said substrate is made from a material having poor thermal conductivity and is placed on a heater block, and wherein said sensor array includes a plurality of

22. (Amended) temperature sensors disposed on the substrate such that a temperature difference between a first portion and a second portion of the substrate can be determined.

23. (Amended) The apparatus of claim 1-6, wherein the at least one thermal property characterized by said sensor array is a complex dielectric constant.

24. (Amended) The apparatus of claim 23, wherein at least one sensor in said sensor array comprises interdigitated electrodes disposed on said substrate.

25. (Amended) The apparatus of claim 1-6, wherein at least one sensor in said sensor array further comprises a thermometer such that said at least one sensor can conduct a dielectric constant measurement and a thermal measurement simultaneously.

113. (New) An apparatus for characterizing one or more material properties for each of 5 or more samples, comprising:

a substrate having 5 or more sensors disposed thereon to form a sensor array, wherein each sensor is associated with one of said 5 or more samples and characterizes at least one thermal property of said one of said 5 or more samples;

an interconnection device electrically coupled with the sensor array; and an electronic platform that sends signals to and receives signals from said sensor array via said interconnection device, wherein the signals received by said electronic platform correspond to said at least one thermal property and wherein at least one sensor in said sensor array comprises:

- i) a microthin film membrane supported by said substrate such that said sensor array is an array of microthin film windows;
- ii) a first wire disposed on said microthin film membrane, said first wire acting as a heater and a first thermometer; and

- iii) a second wire spaced apart from said first wire and disposed on said substrate, said second wire acting as a second thermometer.

114. (New) An apparatus for characterizing one or more material properties for each of 5 or more samples, comprising:

a substrate having 5 or more sensors disposed thereon to form a sensor array, wherein each sensor is associated with one of said 5 or more samples and characterizes at least one thermal property of said one of said 5 or more samples;

a circuit board coupled to said sensor array;

a signal routing means coupled to said sensor array via said circuit board; and

an electronic platform that sends signals to and receives signals from said sensor array via said signal routing means, wherein said signal routing means selectively couples a sensor or a group of sensors in said sensor array to said electronic platform, and wherein the signals received by said electronic platform correspond to said at least one thermal property and wherein at least one sensor in said sensor array comprises:

- i) a microthin film membrane supported by said substrate such that said sensor array is an array of microthin film windows;
- ii) a first wire disposed on said microthin film membrane, said first wire acting as a heater and a first thermometer; and
- iii) a second wire spaced apart from said first wire and disposed on said substrate, said second wire acting as a second thermometer.

115. (New) An apparatus for characterizing one or more material properties for each of 5 or more samples, comprising:

a substrate having 5 or more sensors disposed thereon to form a sensor array, wherein each sensor is associated with one of said 5 or more samples and characterizes at least one thermal property of said one of said 5 or more samples;

a circuit board coupled to said sensor array via a connector, said circuit board having a signal routing means disposed thereon;

an electronic platform that sends signals to and receives signals from said sensor array via said signal routing means, wherein said signal routing means on said circuit board selectively couples a sensor or a group of sensors in said sensor array to said electronic platform, and wherein the signals received by said electronic platform correspond to at least one thermal property and wherein at least one sensor in said sensor array comprises:

- i) a microthin film membrane supported by said substrate such that said sensor array is an array of microthin film windows;
- ii) a first wire disposed on said microthin film membrane, said first wire acting as a heater and a first thermometer; and
- iii) a second wire spaced apart from said first wire and disposed on said substrate, said second wire acting as a second thermometer.

116. (New) An apparatus for characterizing one or more material properties for each of 5 or more samples, comprising:

a substrate having 5 or more sensors disposed thereon to form a sensor array, wherein each sensor is associated with one of said 5 or more samples and characterizes at least one thermal property of said one of said 5 or more samples;

a circuit board including:

a signal routing means; and

electronic test circuitry for sending signals to and receiving signals from said sensor array via said signal routing means, wherein the signals received by said electronic test circuitry correspond to said at least one thermal property of said one of said 5 or more samples, and wherein said signal routing means on said circuit board selectively couples a sensor or a group of sensors in said sensor array to said electronic test circuitry; and

a computer coupled to said circuit board for controlling said signal routing means and said electronic test circuitry, receiving signals generated by said electronic test circuitry, and generating data corresponding to said at



least one thermal property and wherein at least one sensor in said sensor array comprises:

- i) a microthin film membrane supported by said substrate such that said sensor array is an array of microthin film windows;
- ii) a first wire disposed on said microthin film membrane, said first wire acting as a heater and a first thermometer; and
- iii) a second wire spaced apart from said first wire and disposed on said substrate, said second wire acting as a second thermometer.

117. (New) An apparatus for characterizing material properties in a materials library, comprising:

a circuit board including:

a plurality of sensors disposed on said circuit board to form a sensor array, wherein each sensor in said sensor array measures at least one property of a material in the materials library;

a signal routing means; and

electronic test circuitry for sending signals to and receiving signals from said sensor array via said signal routing means, wherein the signals received by said electronic test circuitry correspond to said at least one property of a material in the materials library; and

a computer for controlling said plurality of sensors and said electronic test circuitry, receiving signals generated by said electronic test circuitry, and generating data corresponding to said at least one property of a material in the materials library and wherein at least one sensor in said sensor array comprises:

- i) a microthin film membrane supported by a substrate of said circuit board such that said sensor array is an array of microthin film windows;
- ii) a first wire disposed on said microthin film membrane, said first wire acting as a heater and a first thermometer; and
- iii) a second wire spaced apart from said first wire and disposed on said circuit board, said second wire acting as a second thermometer.

118. (New) An apparatus for characterizing material properties in a materials library, comprising:

a circuit board including:

a plurality of sensors disposed on a substrate mounted on said circuit board to form a sensor array, wherein each sensor in said sensor array measures at least one property of a material in the materials library; and

a signal routing means to route signals to and from said plurality of sensors;

electronic test circuitry for sending signals to and receiving signals from said sensor array, wherein the signals received by said electronic test circuitry correspond to said at least one property of a material in the materials library; and

a computer for controlling said plurality of sensors and said electronic test circuitry, receiving signals generated by said electronic test circuitry, and generating data corresponding to said at least one property of a material in the materials library and wherein at least one sensor in said sensor array comprises:

- i) a microthin film membrane supported by said substrate such that said sensor array is an array of microthin film windows;
- ii) a first wire disposed on said microthin film membrane, said first wire acting as a heater and a first thermometer; and
- iii) a second wire spaced apart from said first wire and disposed on said substrate, said second wire acting as a second thermometer.

119. (New) An apparatus for characterizing one or more material properties for each of 5 or more samples, comprising:

a substrate having 5 or more sensors disposed thereon to form a sensor array, wherein each sensor is associated with one of said 5 or more samples and characterizes at least one thermal property of said one of said 5 or more samples;

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an interconnection device electrically coupled with the sensor array;  
and

an electronic platform that sends signals to and receives signals from said sensor array via said interconnection device, wherein the signals received by said electronic platform correspond to said at least one thermal property and wherein at least one sensor in said sensor array comprises:

a sample support with a thermal measurement pattern disposed thereon;

a gap between said sample support and said substrate for thermally isolating said sample support from said substrate; and

a plurality of bridges connecting said sample support to said substrate over said gap.

120. (New) An apparatus for characterizing one or more material properties for each of 5 or more samples, comprising:

a substrate having 5 or more sensors disposed thereon to form a sensor array, wherein each sensor is associated with one of said 5 or more samples and characterizes at least one thermal property of said one of said 5 or more samples;

a circuit board coupled to said sensor array;

a signal routing means coupled to said sensor array via said circuit board; and

an electronic platform that sends signals to and receives signals from said sensor

array via said signal routing means, wherein said signal routing means selectively couples a sensor or a group of sensors in said sensor array to said electronic platform, and wherein the signals received by said electronic platform correspond to said at least one thermal property and wherein at least one sensor in said sensor array comprises:

a sample support with a thermal measurement pattern disposed thereon;

a gap between said sample support and said substrate for thermally isolating said sample support from said substrate; and

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a plurality of bridges connecting said sample support to said substrate over said gap.

121. (New) An apparatus for characterizing one or more material properties for each of 5 or more samples, comprising:

a substrate having 5 or more sensors disposed thereon to form a sensor array, wherein each sensor is associated with one of said 5 or more samples and characterizes at least one thermal property of said one of said 5 or more samples;

a circuit board coupled to said sensor array via a connector, said circuit board having a signal routing means disposed thereon;

an electronic platform that sends signals to and receives signals from said sensor array via said signal routing means, wherein said signal routing means on said circuit board selectively couples a sensor or a group of sensors in said sensor array to said electronic platform, and wherein the signals received by said electronic platform correspond to at least one thermal property and wherein at least one sensor in said sensor array comprises:

a sample support with a thermal measurement pattern disposed thereon;

a gap between said sample support and said substrate for thermally isolating said sample support from said substrate; and

a plurality of bridges connecting said sample support to said substrate over said gap.

122. (New) An apparatus for characterizing one or more material properties for each of 5 or more samples, comprising:

a substrate having 5 or more sensors disposed thereon to form a sensor array, wherein each sensor is associated with one of said 5 or more samples and characterizes at least one thermal property of said one of said 5 or more samples;

a circuit board including:

a signal routing means; and

electronic test circuitry for sending signals to and receiving signals from said sensor array via said signal routing means, wherein the signals received

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by said electronic test circuitry correspond to said at least one thermal property of said one of said 5 or more samples, and wherein said signal routing means on said circuit board selectively couples a sensor or a group of sensors in said sensor array to said electronic test circuitry; and

a computer coupled to said circuit board for controlling said signal routing means and said electronic test circuitry, receiving signals generated by said electronic test circuitry, and generating data corresponding to said at least one thermal property and wherein at least one sensor in said sensor array comprises:

a sample support with a thermal measurement pattern disposed thereon;

a gap between said sample support and a substrate of said circuit board for thermally isolating said sample support from said substrate; and

a plurality of bridges connecting said sample support to said substrate over said gap.

123. (New) An apparatus for characterizing material properties in a materials library, comprising:

a circuit board including:

a plurality of sensors disposed on said circuit board to form a sensor array, wherein each sensor in said sensor array measures at least one property of a material in the materials library;

a signal routing means; and

electronic test circuitry for sending signals to and receiving signals from said sensor array via said signal routing means, wherein the signals received by said electronic test circuitry correspond to said at least one property of a material in the materials library; and

a computer for controlling said plurality of sensors and said electronic test circuitry, receiving signals generated by said electronic test circuitry, and generating data corresponding to said at least one property of a material in the materials library and wherein at least one sensor in said sensor array comprises:

a sample support with a thermal measurement pattern disposed thereon;

a gap between said sample support and a substrate of the circuit board for thermally isolating said sample support from said substrate; and

a plurality of bridges connecting said sample support to said substrate over said gap.

124. (New) An apparatus for characterizing material properties in a materials library, comprising:

a circuit board including:

a plurality of sensors disposed on a substrate mounted on said circuit board to form a sensor array, wherein each sensor in said sensor array measures at least one property of a material in the materials library; and

a signal routing means to route signals to and from said plurality of sensors;

electronic test circuitry for sending signals to and receiving signals from said sensor array, wherein the signals received by said electronic test circuitry correspond to said at least one property of a material in the materials library, and

a computer for controlling said plurality of sensors and said electronic test circuitry, receiving signals generated by said electronic test circuitry, and generating data corresponding to said at least one property of a material in the materials library and wherein at least one sensor in said sensor array comprises:

a sample support with a thermal measurement pattern disposed thereon;

a gap between said sample support and said substrate for thermally isolating said sample support from said substrate; and

a plurality of bridges connecting said sample support to said substrate over said gap.

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125. (New) An apparatus for characterizing one or more electrical transport properties for each of 5 or more samples, comprising:

a substrate having 5 or more sensors disposed thereon to form a sensor array, wherein each sensor is associated with one of said 5 or more samples and characterizes at least one electrical transport property of said one of said 5 or more samples;

an interconnection device electrically coupled with the sensor array;  
and

an electronic platform that sends signals to and receives signals from said sensor array via said interconnection device, wherein the signals received by said electronic platform correspond to said at least one electrical transport property

a means for generating a magnetic field pointing perpendicular to said substrate wherein said generating means comprises a magnet array having a plurality of magnets arranged in the same format as said sensors in said sensor array, wherein each magnet in said magnet array corresponds with a sensor in said sensor array to generate a magnetic field over the corresponding sensor.

126. (New) An apparatus for characterizing one or more material properties for each of 5 or more samples, comprising:

a substrate having 5 or more sensors disposed thereon to form a sensor array, wherein each sensor is associated with one of said 5 or more samples and characterizes at least one electrical transport property of said one of said 5 or more samples;

a circuit board coupled to said sensor array;

a signal routing means coupled to said sensor array via said circuit board; and

an electronic platform that sends signals to and receives signals from said sensor array via said signal routing means, wherein said signal routing means selectively couples a sensor or a group of sensors in said sensor array to said electronic platform, and wherein the signals received by said electronic platform correspond to said at least one electrical transport property

a means for generating a magnetic field pointing perpendicular to said substrate wherein said generating means comprises a magnet array having a plurality of magnets arranged in the same format as said sensors in said sensor array, wherein each magnet in said magnet array corresponds with a sensor in said sensor array to generate a magnetic field over the corresponding sensor.

127. (New) An apparatus for characterizing one or more material properties for each of 5 or more samples, comprising:

a substrate having 5 or more sensors disposed thereon to form a sensor array, wherein each sensor is associated with one of said 5 or more samples and characterizes at least one electrical transport property of said one of said 5 or more samples;

a circuit board coupled to said sensor array via a connector, said circuit board having a signal routing means disposed thereon;

an electronic platform that sends signals to and receives signals from said sensor array via said signal routing means, wherein said signal routing means on said circuit board selectively couples a sensor or a group of sensors in said sensor array to said electronic platform, and wherein the signals received by said electronic platform correspond to at least one electrical transport property

a means for generating a magnetic field pointing perpendicular to said substrate wherein said generating means comprises a magnet array having a plurality of magnets arranged in the same format as said sensors in said sensor array, wherein each magnet in said magnet array corresponds with a sensor in said sensor array to generate a magnetic field over the corresponding sensor.

128. (New) An apparatus for characterizing one or more material properties for each of 5 or more samples, comprising:

a substrate having 5 or more sensors disposed thereon to form a sensor array, wherein each sensor is associated with one of said 5 or more samples and characterizes at least one electrical transport property of said one of said 5 or more samples;

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a circuit board including:

a signal routing means; and

electronic test circuitry for sending signals to and receiving signals from said sensor array via said signal routing means, wherein the signals received by said electronic test circuitry correspond to said at least one electrical transport property of said one of said 5 or more samples and wherein said signal routing means on said circuit board selectively couples a sensor or a group of sensors in said sensor array to said electronic test circuitry; and

a computer coupled to said circuit board for controlling said signal routing means and said electronic test circuitry, receiving signals generated by said electronic test circuitry, and generating data corresponding to said at least one electrical transport property;

a means for generating a magnetic field pointing perpendicular to a substrate of the circuit board wherein said generating means comprises a magnet array having a plurality of magnets arranged in the same format as said sensors in said sensor array, wherein each magnet in said magnet array corresponds with a sensor in said sensor array to generate a magnetic field over the corresponding sensor.

129. (New) An apparatus for characterizing material properties in a materials library, comprising:

a circuit board including:

a plurality of sensors disposed on said circuit board to form a sensor array, wherein each sensor in said sensor array measures at least one electrical transport property of a material in the materials library;

a signal routing means; and

electronic test circuitry for sending signals to and receiving signals from said sensor array via said signal routing means, wherein the signals received by said electronic test circuitry correspond to said at least one property of a material in the materials library; and

a computer for controlling said plurality of sensors and said electronic test circuitry, receiving signals generated by said electronic test circuitry, and

generating data corresponding to said at least one electrical transport property of a material in the materials library

a means for generating a magnetic field pointing perpendicular to a substrate of the circuit board wherein said generating means comprises a magnet array having a plurality of magnets arranged in the same format as said sensors in said sensor array, wherein each magnet in said magnet array corresponds with a sensor in said sensor array to generate a magnetic field over the corresponding sensor.

130. (New) An apparatus for characterizing material properties in a materials library, comprising:

a circuit board including:

a plurality of sensors disposed on a substrate mounted on said circuit board to form a sensor array, wherein each sensor in said sensor array measures at least one electrical transport property of a material in the materials library; and

a signal routing means to route signals to and from said plurality of sensors;

electronic test circuitry for sending signals to and receiving signals from said sensor array, wherein the signals received by said electronic test circuitry correspond to said at least one property of a material in the materials library; and

a computer for controlling said plurality of sensors and said electronic test circuitry, receiving signals generated by said electronic test circuitry, and generating data corresponding to said at least one electrical transport property of a material in the materials library;

a means for generating a magnetic field pointing perpendicular to said substrate wherein said generating means comprises a magnet array having a plurality of magnets arranged in the same format as said sensors in said sensor array, wherein each magnet in said magnet array corresponds with a sensor in said sensor array to generate a magnetic field over the corresponding sensor.

131. (New) The apparatus of claims 113-124, wherein the thermal property characterized by said sensor array is at least one selected from the group consisting of heat capacity, thermal conductivity, and thermal stability.

132. (New) The apparatus of claims 113-124, wherein at least one sensor in said sensor array comprises:

a microthin film membrane supported by said substrate such that said sensor array is an array of microthin film windows; and

a heater/thermometer pattern disposed on said microthin film membrane.

133. (New) The apparatus of claim 132, wherein said microthin film membrane forming said at least one sensor is a silicon nitride membrane, and wherein said substrate supporting said silicon nitride membranes in said sensor array is a silicon wafer.

134. (New) The apparatus of claims 113-124, wherein said microthin film membrane forming said at least one sensor is a silicon nitride membrane, and wherein said substrate supporting said silicon nitride membranes in said sensor array is a silicon wafer.

135. (New) The apparatus of claims 113-124, wherein said substrate is made of a polymer sheet, and wherein said sensor array includes a plurality of heaters/thermometers disposed on said polymer sheet.

136. (New) The apparatus of claim 135, wherein said polymer sheet is a polyimide.

137. (New) The apparatus of claim 135, wherein said plurality of heaters/thermometers is printed on said polymer sheet via lithography.

138. (New) The apparatus of claim 113-124, wherein said substrate is made of a poor thermal conducting material that is at least 100 microns

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thick, and wherein said sensor array includes a plurality of heaters/thermometers disposed on said poor thermal conducting material.

139. (New) The apparatus of claim 138, wherein said plurality of heaters/thermometers is printed on a glass plate via lithography.

140. (New) The apparatus of claim 113-124, wherein said substrate is made of a polymer sheet.

141. (New) The apparatus of claim 113-124, wherein said substrate is made from a material having poor thermal conductivity and is placed on a heater block, and wherein said sensor array includes a plurality of temperature sensors disposed on the substrate such that a temperature difference between a first portion and a second portion of the substrate can be determined.

142. (New) The apparatus of claim 141, wherein said substrate is a glass plate.

143. (New) The apparatus of claim 113-124 wherein the at least one thermal property characterized by said sensor array is a complex dielectric constant.

144. (New) The apparatus of claim 143, wherein at least one sensor in said sensor array comprises interdigitated electrodes disposed on said substrate.

145. (New) The apparatus of claim 113-124, wherein at least one sensor in said sensor array further comprises a thermometer such that said at least one sensor can conduct a dielectric constant measurement and a thermal measurement simultaneously.

146. (New) The apparatus of claims 125, 126, 127, 128, 129 or 130, wherein the electrical transport property characterized by said sensor array is

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